Mark Scheme (Results)

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Pearson BTEC Nationals
In Applied Human Biology
(21325L)
Unit 1: Principles of Applied Human Biology

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Unit 1: Principles of Applied Human Biology marking grid

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks if a learner's response is not rewardable, according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

- The marking grids have been designed to assess learner work holistically.
- Rows within the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.
- Examiners should first make a holistic judgement on which band most closely matches the learner response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bull

Question number	Answer	Additional Guidance	Mark
1 (a)	Bowman's capsule	Allow glomerulus Allow phonetic spelling	(1)
1 (b)	Award **1** mark for identification and **1** mark for linked expansion. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** (large) surface area (1) **Expansion** maintains concentration gradient (1) increases rate of diffusion/facilitated diffusion/active transport (1) OR **Identification** thin walls/one cell thick (1) **Expansion** shorter diffusion pathway (1) increases rate of diffusion/facilitated diffusion (1)		(2)
1 (c)(i)	C osmosis		(1)
1 (c)(ii)	increases/more concentrated (urine)	Allow "stronger"	(1)
1 (d)	(in blood entering there is) (more) urea/(more) oxygen/(higher) pressure/(less) carbon dioxide Accept any other reasonable response	ORA ignore references to "waste substances"	(1)
		Total	6 marks

Question number	Answer	Additional Guidance	Mark
2 (a)	A B lymphocytes		(1)
2 (b)	Award **1** mark for identification and **1** mark for a linked expansion. Up to a maximum of **3** marks. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** secondary response is faster (1) **Expansion** {memory cells/B lymphocytes} in body (1) produced during primary immune response (1) respond/produce antibodies faster (1)	ORA throughout allow description of **speed** increasing allow "goes up" allow "higher"	(3)
2 (c)	Award **1** mark for identification and **1** mark for a linked expansion. Up to a maximum of **3** marks. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** • (viruses) have different antigens/(surface) proteins (1) **Expansion** • antibodies only recognise/bind/complimentary to one antigen (1) • due to (antibody) shape/variable region that fits specific antigen (1) • immune system does not have antibodies for/cannot recognise (chicken pox) antigen/virus (1) Accept any other reasonable response.		(3)
		Total	7 marks

Question number	Answer	Additional Guidance	Mark
3 (a)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers. • impulse travels as an electrical signal in the neurone and chemical signal across the synapse • electrical impulse travels along the presynaptic neuron as a series of action potentials • electrical impulse arrives at axon terminal and triggers influx of calcium ions • (which leads to) release of neurotransmitters • by exocytosis/vesicles containing neurotransmitters fuse with the membrane and release neurotransmitter • neurotransmitters diffuse across the synapse • due to concentration gradient which is a passive process • neurotransmitters bind to receptors on postsynaptic membrane/cell • which causes sodium ions channels to open • influx of sodium ions causes action potential in post synaptic neurone/axon • electrical impulse triggered in postsynaptic neurone		(6)

Mark scheme (award up to 6 marks). Refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1–2	• Demonstrates isolated knowledge and understanding, there be major gaps or omissions • Generic statements may be presented rather than linkages being made so that lines of reasoning are not present • Limited explanation which is not logically ordered and with significant gaps.
Level 2	3–4	• Demonstrates mostly accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor • Some linkages are made so that lines of reasoning are partially present • Displays a partially developed explanation that has a structure which is mostly clear, coherent and logical with only minor omissions.

Level 3	5–6	• Demonstrates accurate and thorough/detailed knowledge and understanding • Linkages are consistently made so that lines of reasoning are sustained • Displays a well-developed explanation that has a structure which is clear, coherent and logical.

Question number	Answer	Additional Guidance	Mark
3 (b)	knee (1) reflex (1)	Accept "tendon" ignore "leg" allow involuntary	(2)
		Total	8 marks

Question number	Answer	Additional Guidance	Mark
4 (a)	Award **1** mark for each of the following. Up to a maximum of **2** marks. sensors/electrodes attached to skin (1) heart electrical signals detected (1) signals sent to a computer/ can be viewed on a screen/print out (1)	Allow reference to PQRST	(2)
4 (b)(i)	Divide (1) 60 / 5 Multiply (1) 12*6 Evaluation (1) 72	Award 3 marks for 72 with no working shown	(3)

4 (b)(ii)	Award **1** mark for identification and **1** mark for linked expansion. Any point may count as identification or expansion depending on how learners structure their answer. gaps between cycles are different (1) so patient's heart is not beating regularly (1) patient B has arrhythmia (1)	Ignore references to abnormal heart Allow specific example (may be marked on diagram)	(2)
4 (c)	Award **1** mark for identification and **1** mark for each linked expansion. Up to a maximum of **4** marks. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** pulse oximetry/sensor clipped on to finger (1) **Expansion** laser/light shone through (1) (measures) amount of light absorbed by the blood (1) OR **Identification** arterial blood gas assessment (1) **Expansion** blood sample taken from wrist (1) partial pressure/saturation of oxygen measured (1) OR **Identification** capillary blood gas assessment (1) **Expansion** blood sample taken from earlobe (1) partial pressure/saturation of oxygen measured (1)	Allow description Allow other named artery Allow other named sample site	(4)

		Total	11 marks

Question number	Answer	Additional Guidance	Mark
5 (a)(i)	B glycolipid		(1)
5 (a)(ii)	stabilises the membrane/provides support		(1)
5 (b)	Award **1** mark for each identification and **1** mark for each linked expansion. Up to a maximum of **4** marks. Any point may count as identification or expansion depending on how learners structure their answer. **similarity** **Identification** both passive processes (1) **Expansion** no requirement for metabolic energy/ATP/(1) both move substances down the concentration gradient (1) **difference** **Identification** facilitated diffusion uses (specific) protein channels (1) **Expansion** as substances are not able to cross the phospholipid bilayer (1)	ORA throughout Allow specific reasons, e.g. charge, size	(4)
5 (c)(i)	mitochondria/mitochondrion	Allow phonetic spelling	(1)
5 (c)(ii)	Any **3** points from the following in a logical order. produces ADP (1) removal of one phosphate group (1) breaking/hydrolysis of high energy bond (1) by the enzyme ATPase (1) releasing energy (stored in the bond) (1)	Reject creates energy	(3)
		Total	10 marks

Question number	Answer	Additional Guidance	Mark
6 (a)	A calcium		(1)
6 (b)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers. Chemical processes • amylase in saliva breaks down starch to maltose • stomach acid provides correct pH for pepsin • pepsin in stomach breaks down protein to peptides • lipase and trypsin secreted by pancreas into small intestine • lipase breaks down lipids to fatty acids and glycerol • trypsin breaks down peptides to amino acids • bile salts from the liver/gall bladder emulsify lipids and neutralise acidic chyme • (which) increases surface area for lipases/enzymes to work Optimum conditions • constant internal temperature maintained at 37^{o}C • pH changes throughout digestive system • pH affects tertiary structure of enzymes • mouth slightly acidic –correct pH for salivary amylase • stomach acidic to allow action of pepsin • duodenum alkaline for digestion of fats/action of trypsin/lipase/pancreatic amylase • length of gut/transit time – time for enzymes to break down food • concentration gradient maintained with good blood supply • large surface area of small intestine for absorption of products		(9)

Mark scheme (award up to 9 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1–3	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited discussion that contains generic assertions rather than considering different aspects and the relationship between them.

Level 2	4–6	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear. • Displays a partially developed discussion that considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.	
Level 3	7–9	• Demonstrates mostly accurate and detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a well-developed and logical discussion that clearly considers a range of different aspects and how they interrelate, in a sustained way.	
		Total	10 marks

Question number	**Answer**	**Additional Guidance**	**Mark**
7 (a)(i)	B CACGUGGACUGAGGACUC		(1)
7 (a)(ii)	6/six		(1)
7 (b)(i)	D translation		(1)
7 (b)(ii)	Award **1** mark for any of the following in a logical order. Up to a maximum of **4** marks. • (each tRNA molecule) attached to an amino acid (1) • transports the amino acid to the ribosome (1) • anticodon on tRNA (1) • (anticodon) is complimentary to codon/sequence on mRNA (1) • (temporary H) bonds formed to mRNA (1) • {amide/peptide} bonds formed between (adjacent) amino acids (1) • tRNA is recycled/joined to another free amino acid (1)		(4)

7 (c)(i)	Award **1** mark for identification and **1** mark for a linked expansion. Up to a maximum of **4** marks. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** (mutation) in a {gene/allele/coding sequence} (1) **Expansion** different amino acid in the (polypeptide) chain/incorrect primary (protein) structure (1) so different folding/tertiary structure (1) OR **Identification** (mutation) in start codon (1) **Expansion** protein does not get made (1) OR **Identification** (mutation) in a stop codon (1) **Expansion** alters/increases the length of the protein chain (1) OR **Identification** (mutation) may change a control gene (1) **Expansion** alters which genes are switched on/off in a cell (1) changes to the cell cycle/cell division (1) OR **Identification** (mutation) may **turn on** (proto)oncogene **Expansion** increasing cell division (1) OR **Identification** (mutation) may **turn off** a tumour suppressor gene (1) **Expansion** increasing cell division (1)	ignore reference to change in chromosome number/structure Allow specific terms of substitution, insertion, deletion, frameshift mutation etc allow "cell divides uncontrollably" allow "causes cancer" allow "cell divides uncontrollably" allow "causes cancer"	(4)

7(c)(ii)	Award **1** mark for identification and **2** marks for linked expansion. Up to a maximum of **3** marks. Any point may count as identification or expansion depending on how learners structure their answer. **Identification** amino acid sequence/polypeptide/structure remains the same (1) **Expansion** new codon results in same amino acid (1) (most) amino acids have more than one codon/degenerate code (1) OR mutation within intron (1) (intron) is spliced out (1) Allow any other reasonable response	allow references to "correct" sequence allow "silent mutation"	(3)
		Total	14 marks

Question number	Answer	Additional Guidance	Mark
8 (a)	Award **1** mark for each logically ordered point. Up to a maximum of **3** marks. (specific) receptors on killer T cells (1) binds to cell surface viral antigens/proteins (1) T cell disrupts cell membrane (1) cytotoxic chemicals enter cell (1) cells undergo apoptosis/cell death (1) Allow any other reasonable response		(3)

8 (b)	number of white blood cells counted/ full blood count (1) amount of {immunoglobulin proteins/antibodies} measured (1) Allow any other reasonable response	Allow "Ig" for immunoglobulin	(2)
8 (c)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers. Stem cell therapy Pros • unlike other transplants, doesn't need immunosuppressant drugs • better for the long term • patient can become immune to pathogens • patient can be vaccinated Cons • invasive procedure • chance of failure • risk of cancer • partial functioning immune system may reject transplant • new immune system may attack existing body cells • requires greater recovery time • more expensive for NHS Immunoglobulin replacement therapy Pros • less invasive procedure • no chance of rejection • cheaper for NHS Cons • immunity is passive • only targets selected pathogens • must be performed regularly • patient can never develop active immunity • needs patient to attend hospital regularly • affects quality of life Conclusions • both treatments available on NHS so no difference in cost to patient • decision may depend on the SCID severity/age of patient Accept other appropriate responses.		(9)
		Total	12 marks

Mark scheme (award up to 9 marks). Refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.		
Level	**Mark**	**Descriptor**
Level 0	0	No rewardable material.
Level 1	1–3	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited evaluation that contains generic assertions, leading to a conclusion that is superficial or unsupported.
Level 2	4–6	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear. • Displays a partially developed evaluation that considers some different competing points, although not always in detail, leading to a conclusion that is partially supported.
Level 3	7–9	• Demonstrates mostly accurate and thorough/detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a developed and logical evaluation that clearly considers different aspects and competing points in detail, leading to a conclusion that is fully supported.